

## REMARKS

Favorable reconsideration and allowance of all pending claims are respectfully requested. For the reasons indicated in detail below, these claims are believed to define patentable subject matter.

The claims have been amended in order to better particularly point out and distinctly claim the subject matter which the applicants claim as their invention. Support for these amendments may be found in the specification. The hereinabove described amendments are believed to introduce no new matter.

Claims 1-3, 5-7, 8 and 10-11 stand rejected under 35 U.S.C. 102(b) as being anticipated by Sechrist et al. (U.S. 6,117,809).

By way of review, the present invention is a process for the production of high purity hydrogen containing essentially no carbon monoxide from a catalytic reformer. The catalytic reformer has a first catalytic reforming zone in a lead position followed by a second catalytic reforming zone in a lag position. In accordance with the present invention, the inlet temperature of the second catalytic reforming zone is reduced and the inlet temperature of the first catalytic reforming zone is increased to restore the original predetermined conversion or product octane, and to thereby significantly reduce the concentration of carbon monoxide in the net hydrogen product stream.

Although the '809 reference teaches that reforming zones are maintained at a temperature of 454° - 538°C, the reference fails to teach that the inlet temperature of a lag catalytic reforming zone is reduced and the inlet temperature of the lead reforming catalyst zone is increased to restore the original predetermined conversion or product octane to thereby significantly reduce the concentration of carbon monoxide in the net hydrogen product stream. The Examiner is reminded that each and every limitation in a claim must be found in a single reference for the reference to anticipate the claim. Therefore, the applicants assert that the '809 reference fails to anticipate the process of the present invention.

Claims 4, 9 and 13 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Sechrist et al. (U.S. 6,117,809) in view of Anumakonda et al. (U.S. 6,221,280). The '809 reference teaches a process for catalytic reforming but fails to teach a liquid hour space velocity from about 0.5 to about 4 hr<sup>-1</sup>.

The '280 reference discloses a method of processing sulfur containing heavy hydrocarbon fuels in a substantial absence of steam through catalytic partial oxidation. The method comprises the steps of vaporizing a heavy hydrocarbon fuel and bringing the vaporized fuel and oxidizer mixture in contact with a noble metal catalyst. The hydrocarbon fuel is considered to be a liquid hydrocarbon having at least 6 carbon atoms and a sulfur content of at least 50 ppm. The feed is partially oxidized by a catalytic reaction occurring at a temperature of no less than about 1050°C (1922°F) with the catalytic partial oxidation process producing essentially complete conversion of hydrocarbons to hydrogen and carbon monoxide. The sulfur compounds in the feed are predominantly converted into hydrogen sulfide. The product gas consists mainly of carbon monoxide and hydrogen. The '809 reference teaches that catalytic reforming is a hydrocarbon conversion process employed for improving the octane quality of hydrocarbon feedstocks, the primary product of catalytic reforming being motor gasoline. In catalytic reforming a feedstock is admixed with a recycle stream comprising hydrogen and contacted with catalyst in a catalytic reforming reaction zone. The usual feedstock for catalytic reforming is a petroleum fraction known as naphtha and having an initial boiling of about 180°F (82°C) and an end boiling point of about 400°F (204°C). The catalytic reforming process is particularly applicable to the treatment of straight run gasoline comprised of relatively large concentrations of naphthenic and substantially straight chain paraffinic hydrocarbons which are subject to aromatization through dehydrogenation and/or cyclization reactions. (See col. 8 line 56 - col. 9 line 6.)

The '809 reference additionally teaches that hydrogen sulfide can harm the performance of the reforming catalyst by poisoning the metal component and thereby deactivating the catalyst. In order to avoid these harmful effects, it is preferred that the sulfur concentration of the hydrocarbon feedstock be maintained as low as possible in order to minimize the presence of sulfur in the recycle gas and the net gas.

The hereinabove individual discussion of each of the cited references, '280 and '809, is not made to individually attack each of the references, since the Examiner has asserted that the primary reference, '809, can be modified by the teachings of the '280 reference to arrive at the process of the present invention. With all of the differences between the '809 reference and the '280 reference, which have been pointed out hereinabove, the applicants respectfully submit that an artisan would have no incentive to utilize the '280 reference to modify the '809 reference in order to arrive at the process of the present invention. In fact, if an artisan was to adopt the teachings of the '280 reference, she would introduce deleterious sulfur into the reforming process of the '809 reference and would operate the catalytic reaction at a temperature much greater than that taught for reforming in the '809 reference. The applicants not only assert that the '280 reference would not be utilized by an artisan, but that the '280 reference constitutes a teaching away from the reforming process of the present invention.

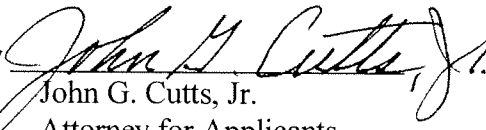
The fact that individual components can be found in prior art and rearranged to provide the benefits of the reforming process of the present invention is not a proper basis for an obviousness rejection. There must be something more in the art to suggest the modification of the cited references in obtaining the benefit that the applicants have discovered. One of ordinary skill in the art would not know the advantages which had been discovered by the applicants and described in the specification of the present application. The mere application of broad principles or goals is insufficient to provide the missing motivation or suggestion to the *prima facie* case. The use of scientific principle alone has been specifically rejected as sufficient to support a *prima facie* case of obviousness where the prior art does not suggest the desirability of the modification. Moreover, widely known and simple components when integrated into a beneficial invention are not obvious despite the use with which the two components may have been integrated if one skilled in the art recognized the benefit of the integrations.

Based upon the hereinabove discussion, the applicants respectfully submit that the rejection of the pending claims under 35 U.S.C. 103 is not supported by a *prima facie* case of obviousness and should be withdrawn in view of the degree of disassembly and altered reconstruction of the prior art required to construct the applicants' invention. The applicants respectfully submit that the

Examiner has cited no prior art references, either alone or in combination which disclose, teach or suggest the integrated essential features of the present invention.

In view of the hereinabove discussion, it is respectfully submitted that all of the pending claims are allowable over 35 U.S.C. 102 and 35 U.S.C. 103 and that the application is in condition for allowance. Favorable reconsideration and allowance of the pending claims are therefore courteously solicited.

Respectfully submitted,  
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